Abstracts

Wednesday, April 30

Session I2: Assessing the Effects of Prolonged Drought and Wildfires on Water Quality and Habitat

3:30 – 5:00 pm | Room 262

Application of Continuous and Periodic Monitoring to the Assessment of the Impacts of the 2012-2013 Drought on Groundwater Conditions in Illinois

Robert Kay
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Abstract
Continuous measurement of groundwater levels in performed at more than 70 wells in Illinois have enabled assessment of the timing and magnitude of the 2012-2013 drought, and the recovery from the drought, on selected aquifers. Data indicate water-level declines in drift deposits typically began in about late April to early May 2012, reached minimum in February 2013, and rose to maximum (slightly higher than pre-drought) values by late April to early May 2013. Water-level declines in the drift deposits from May 2012 through February 2013 typically ranged from about 3 to 12 feet in areas not clearly impacted by high-capacity pumping. These trends were consistent throughout the state with the exception of wells in the city of Chicago, where groundwater levels did not clearly respond to the drought. Drought effects may not have been observed in Chicago because sewers and water lines may the most substantial portion of the groundwater recharge. Periodic water-level measurements from wells with a period of record of 5 years or more indicate that the 2012-2013 drought typically had either the lowest, of second lowest water levels.

Water-level declines in the drift deposits from May 2012 through February 2013 typically ranged from about 8 to 35 ft in areas impacted by high-capacity pumping, with these large declines occurring during the summer months. Comparison of continuous water-level data from wells open to the Cambrian- Ordovician aquifer system in northeast Illinois during the summer of 2012 with water-level data from 20011 and 2013 indicates substantially a larger decline during the summer of 2012, presumably due to increased pumping from the aquifer in response to the drought.

Dedicated Volunteers Test Water during Extreme Drought in Texas

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Abstract
The Colorado River Watch Network (CRWN) is the largest volunteer water quality monitoring program in Texas. About 100 volunteers monitor more than 100 sites along a 600-mile stretch of the lower Colorado River between San Saba and Matagorda Bay. The Colorado River empties into the Gulf of Mexico. Volunteers began monitoring the river in 1988 and the Lower Colorado River Authority (LCRA) has supported this effort since 1992. CRWN volunteers sign on to monitor one or more sites once a month for two years. Many of the volunteers continue to monitor well beyond their initial commitment.

Today's volunteers are monitoring the river under extreme drought conditions. Texas experienced its Drought of Record in the 1950s. Currently, the combined storage of the two water supply reservoirs in the Highland Lakes above Austin is 38 percent full of capacity. If combined storage falls below 30 percent or reaches 600,000 acre-feet, this drought will officially become the Drought Worse than the Drought of Record.

CRWN volunteers continue to visit their sites each month and document the drought's impact through photographs. Aside from the obvious sight of the lakes and tributaries drying up, the impact is most apparent downstream of Austin where the flow has reached historic lows. Due to the drought, LCRA has reduced the amount of water released below Austin to about 50 cubic feet per second per day – a flow that helps protect the environmental integrity of the river. Besides the water released for environmental flows, treated effluent from the City of Austin provides the river with water. CRWN monitors have found increased levels of nitrates that produced an abundance of aquatic plants. In some parts of the river, about 80 percent of the surface is covered with algae and aquatic plants. CRWN monitors also have detected wide swings in dissolved oxygen levels, with lows that sometimes dip below 4 mg/L. The drought already has had a significant impact on water quality, but it could become much worse, and the CRWN volunteers will be there to document the impact.

Effect of Drought on the Transport of Nitrate in a Midwest Stream

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Abstract
Data were collected as part of study partially funded by The Nature Conservancy and the U.S. Geological Survey to better quantify the impact of rainfall on nitrate concentrations and transport in the Boone River watershed in north central Iowa. Nitrate-nitrogen concentrations were measured continuously (15-minute intervals) in 2012 when rainfall and runoff was substantially below normal and in the spring and early summer of 2013 when rainfall was greater than normal. Nitrate loads were calculated using continuous nitrate concentrations and streamflow measurements to increase the accuracy of the load estimates.

Runoff during the 2012 growing season (April through September) in the Boone River was about 50,000 acre feet during the 2012 growing season. The dry 2012 growing season was followed by a wetter 2013 growing season when more than 380,000 acre feet flowed from the Boone River watershed.

The average daily nitrate concentration through the growing season was more than 10 mg/L greater in 2013 than in 2012. During dry conditions in 2012, daily mean nitrate concentrations peaked in May at 20.9 mg/l and then decreased rapidly to less than 1.0 mg/l by the middle of July. Nitrate concentrations in 2013 also peaked in May but the maximum daily concentration (29.8 mg/L) was not only greater in 2012, but elevated nitrate concentrations greater than 10 mg/L persisted for an extended period of time(March through July) before decreasing to less than 1.0 mg/L in mid-August.

A combination of greater streamflow and nitrate concentrations resulted in greater than 10 times more nitrate being transported from the Boone River watershed in 2013 than in 2012 even though the amount of runoff was only 7 times greater in 2013 than in 2012. Although a number of factors may be responsible for the disproportionate nitrate transport in relation to runoff, these results suggest that accumulation of residual nitrogen in the watershed in 2012 was available to be flushed from the soil by spring and summer rains in 2013.

Fish Consumption and Contaminants in Fish from the Los Angeles and San Gabriel Rivers Watersheds

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Abstract
The highly urbanized Los Angeles and San Gabriel River watersheds provide a wide range of beneficial uses to a population of over five million people. However, prior to 2007, little was known regarding the safety of consuming recreational sport fish from local rivers, streams and lakes. Sampling contaminants in fish tissues from urban lakes and streams was begun by the Stakeholders of the San Gabriel River Watershed Monitoring Program (SGRRMP) and Los Angeles River Watershed Monitoring Program (LARWMP) in 2006 and 2009, respectively. These programs were designed to answer the question, 'Is it safe to eat fish?'

Fish consumption safety was assessed by measuring tissue concentrations of mercury, selenium, DDT and PCB from composites of fish collected at popular angling sites. Consistent with findings statewide, mercury concentrations in largemouth bass consistently exceeded the Office of Environmental Health Hazard Assessment (OEHHA) no consumption threshold in numerous lakes throughout the Los Angeles and San Gabriel River watersheds. The concentrations of PCBs were elevated in fish from the estuaries and in some lakes, and DDT concentrations were low in all fish. Anglers were surveyed between 2010 and 2012 at popular fishing locations in the watersheds to understand their catch and consumption habits. The results of these surveys indicate that while consumption levels of the most heavily contaminated fish are relatively low and overall fish consumption in these lakes were lower compared to pier anglers, the potential exists that some anglers may be consuming contaminated fish with limited knowledge of the health risks.